

8581
1958

Office Copy



**FEDERAL - STATE - PRIVATE COOPERATIVE
SNOW SURVEY and WATER SUPPLY FORECASTS
for
MONTANA & NORTHERN WYOMING**

**UNITED STATES DEPARTMENT of AGRICULTURE---SOIL CONSERVATION SERVICE,
and
MONTANA AGRICULTURAL EXPERIMENT STATION**

In cooperation with the U.S. Forest Service, U.S. Geological Survey,
National Park Service, U.S. Bureau of Reclamation, State Engineers of
Montana and Wyoming and other Federal, State and private organizations.

AS OF
JAN 1st 1958

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

TO RECIPIENTS OF COOPERATIVE SNOW SURVEY AND WATER SUPPLY FORECAST REPORTS:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Fortunately, most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from fore-knowledge of the runoff.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, about 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1300 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

By relating snow survey measurements taken over a period of years to spring-summer runoff during the same period, relationships have been developed which make it possible to forecast seasonal runoff several months in advance of occurrence. In order to make a forecast, once a forecast relationship has been developed, the maximum snow water content at previously selected key snow courses is usually entered in the forecast relationship. More accurate forecasts are often obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast relationships.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	COOPERATING WITH	LOCATION
RIVER BASINS			
COLORADO, RIO GRANDE AND PLATTE-ARKANSAS	MONTHLY (FEB.-MAY)	COLO. EXP. STATION	FT. COLLINS, COLO.
COLUMBIA <i>Includes Alaska</i>	MONTHLY (JAN.-MAY)		BOISE, IDAHO
UPPER MISSOURI	MONTHLY (FEB.-MAY)	MONT. AGR. EXP. STATION	BOZEMAN, MONTANA
WEST-WIDE	SEMI-ANNUALLY (OCT. 1 AND APR. 1)	COOPERATORS	PORTLAND, OREGON
STATES			
ARIZONA	SEMI-MONTHLY (JAN. 15-APR. 1)	SALT R. VALLEY WATER USERS ASSOCIATION	PHOENIX, ARIZONA
NEVADA	MONTHLY (FEB.-APR.)	NEVADA STATE ENGINEER	RENO, NEVADA
OREGON	MONTHLY (JAN.-MAY)	ORE. AGR. EXP. STATION	PORTLAND, OREGON
UTAH	MONTHLY (JAN.-MAY)	UTAH STATE ENGINEER UTAH AGR. EXP. STATION	SALT LAKE CITY, UTAH
WASHINGTON	MONTHLY (FEB.-MAY)	WASH. STATE DEPT. OF CONSERVATION AND DEVELOPMENT	SPOKANE, WASHINGTON
WYOMING	MONTHLY (FEB.-JUNE)	WYOMING STATE ENGINEER	CASPER, WYOMING

Copies of the various reports may be secured from: Head, Water Supply Forecasting Section
Soil Conservation Service
209 S.W. 5th Avenue, Portland 4, Oregon

PUBLISHED BY OTHER AGENCIES

OTHER SNOW SURVEY REPORTS

BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	COMPTROLLER, WATER RIGHTS BR., DEPT. OF LANDS AND FORESTS, PARLIAMENT BLDGS. VICTORIA, B.C.
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIFORNIA DEPARTMENT OF WATER RESOURCES, SACRAMENTO, CALIFORNIA

FEDERAL - STATE COOPERATIVE
SNOW SURVEYS and WATER SUPPLY FORECASTS
for
MONTANA AND NORTHERN WYOMING
(Upper Missouri and Upper Columbia River Basins)

Report Prepared by:

A. R. Codd
Hydraulic Engineer
Soil Conservation Service

Soil Conservation Service
U. S. Department of Agriculture
and
Montana Agricultural Experiment Station
Bozeman, Montana

Report issued by:

H. D. Hurd
State Conservationist
of Montana

O. W. Monson
Irrigation Engineer
Montana Agricultural
Experiment Station

M. M. Kelso, Director
Montana Agricultural
Experiment Station

WATER SUPPLY OUTLOOK
from
SNOW SURVEYS
January 1, 1958

MISSOURI BASIN

The January first 1958 snow-pack measured at a few index courses is roughly 75 to 90 per cent average. At most places measured there is slightly less snow than for the past three years. As usual on January first the pack is well scattered and has no general pattern. Comparison of the accompanying data will verify this fact.

COLUMBIA BASIN

The snow-pack on January first 1958 at most locations on the Flathead Basin is slightly below average. The accompanying data will show that this year is not too different from past years.

MONTANA SNOW SURVEYS - JANUARY 1, 1958

					SNOW COVER MEASUREMENTS				
			Date of Survey	1958 Snow Depth (In.)	Water Content (In.)	Past Record			Total Years of Record
						Water Content (In.)			
MISSOURI BASIN DRAINAGE BASIN AND SNOW COURSE	No.	Elev.				1957	1956	15-Year Average 1938-52	
<u>JEFFERSON RIVER</u>									
(Rock-Beaverhead)									
Gibbons Pass	13D2	7100	1/3	44.	10.9	11.2	19.5	11.2**	8
<u>MADISON RIVER</u>									
Hebgen	11E5	6550	1/4	24	5.0	6.6	7.1	5.6	23
21-Mile	11E6	7150	1/5	29	6.1	9.3	15.2	7.7*	19
W. Yellowstone	11E7	6700	1/4	20	3.4	5.6	8.9	5.2*	20
<u>GALLATIN RIVER</u>									
21-Mile	11E6	7150	1/5	29	6.1	9.3	15.2	7.7*	19
<u>MISSOURI RIVER MAIN STEM</u>									
Chessman Res.	12C5	6200	12/30	9	1.4	0.1	3.6	2.1	22
Pipestone Pass	12D1	7200	1/2	12	2.2	-	0.5	-	2
Tenmile, Lower	12C2	6250	12/29	17	2.7	2.2	5.4	2.8	22
Tenmile, Middle	12C3	6800	12/29	16	4.7	3.9	8.3	5.0	23
Tenmile, Upper	12C4	8000	12/28	28	5.6	5.2	9.8	5.6	23
(Marias River)									
Marias Pass	13A5	5250	1/3	30	8.0	8.4	8.8	7.8	23
<u>UPPER YELLOWSTONE</u>									
Cooke City	10D7	7400	12/30	19	3.0	3.5	5.9	4.1**	11

* Less than 15 years in 1938-52 period. Average for 15 years nearest the base period

** Average for period of record

MONTANA SNOW SURVEYS - JANUARY 1, 1958

COLUMBIA BASIN DRAINAGE BASIN AND SNOW COURSE			SNOW COVER MEASUREMENTS							Total Years of Record
			1958			Past Record		(In.) 15-Year Average 1938-52		
			Date	Snow	Water	Water Content				
			of	Depth	Content	1957	1956			
No.	Elev.	Survey	(In.)	(In.)						
<u>FLATHEAD RIVER</u>										
Coyote Hill	13B10	4200	12/31	23	4.8	4.8	7.0	5.2**	6	
Desert Mountain	13A2	5600	1/4	28	5.7	6.4	8.5	6.0**	8	
Marias Pass	13A5	5250	1/3	30	8.0	8.4	8.8	7.8	23	
Spotted Bear Mt.	13B2	7000	1/3	24	5.4	5.9	7.9	--	2	
Trout Lake	13A12	3600	1/3	27	5.7	4.9	6.6	--	3	
Twin Creeks	13B11	3580	1/2	22	4.1	3.5	4.8	--	2	
<u>CLARK FORK BASIN</u>										
Coyote Hill	13B10	4200	12/31	23	4.8	4.8	7.0	5.2**	6	
Chessman Res.	12C5	6200	12/30	9	1.4	0.1	3.6	2.1	22	
Fish Lake, Idaho	21B4	5000	12/31	74	15.9	17.6	27.2	--	4	
Lubrecht Forest #6	13C8	5400	1/2	12	1.6	1.1	3.7	1.6**	7	
Pipestone Pass	12D1	7200	1/2	12	2.2	--	5.0	--	2	
Storm Lake	13C7	7780	1/4	24	5.6	6.0	10.6	--	2	
Tenmile, Lower	12C2	6250	12/29	17	2.7	2.2	5.4	2.8	22	
Tenmile, Middle	12C3	6800	12/29	26	4.7	3.9	8.3	5.0	23	
Tenmile, Upper	12C4	8000	12/28	28	5.6	5.2	9.8	5.6	23	
TV Mountain	14B1	6800	12/30	36	7.5	8.2	--	--	1	
#Lookout	15B2	5250	12/30	79	18.9	15.6	27.0	18.1**	8	
<u>BITTERROOT</u>										
Gibbons Pass	13D2	7100	1/3	44	10.9	11.2	19.5	11.2**	8	

** Average for period of record

Adjacent Basin

STATUS OF RESERVOIR STORAGE
MISSOURI RIVER IN MONTANA
January, 1958

BASIN & STREAM	RESERVOIR	USABLE CAPACITY 1000 A.F.	USABLE STORAGE - 1000 ACRE FEET				
			1958	1957	1956	1938-52 AVG.	YRS.
MISSOURI RIVER BASIN							
Beaverhead	Lima	84.0	27.1	7.1	19.9	33.5*	16
Madison River	Hebgen Lake	345.0	157.4	156.5	184.9	241.6	22
Madison River	Ennis Lake	41.0	38.7	38.0	31.7	34.1	22
Hyalite Creek	Middle Creek	8.0	3.5	2.8	3.0	3.2**	6
Missouri River	Canyon Ferry	2043.0	1779.0	1589.0	1646.0	135.2**	5
Missouri River	Hauser Lake						
	& Lk. Helena	62.5	63.8	60.8	60.2	44.2*	18
Missouri River	Lake Helena	10.4	10.9	9.8	9.6	6.2**	10
Missouri River	Holter Lake	81.9	55.4	73.5	50.6	58.4	22
N.Fk. Sun River	Gibson	105.0	26.5	38.6	69.2	55.1	22
N.Fk. Sun River	Willow Creek	32.3	18.8	22.9	26.7	12.5	22
N.Fk. Sun River	Pishkun	32.0	12.7	17.0	16.8	15.6	22
Tiber	Marias	1316.0	620.6	647.8	51.5	- -	2
Birch Creek	Swift	30.0	15.2	21.2	21.0	18.2	22
Dupuyer & Birch	Lake Francis	112.0	94.2	90.0	92.5	72.5	22
Judith River	Ackley Lake	5.8	4.4	- -	4.2	4.2	18
Missouri River	Ft. Peck 3/	19410.0	7584.0	6014.0	5294.0*	10520.0*	17
Milk River	Fresno	127.2	60.4	78.0	70.0	55.8	18
Milk River	Nelson	66.8	53.9	53.0	41.4	29.6	22
W. Rosebud Cr.	Mystic Lake	20.8	13.3	7.9	9.5	11.1	22
Tongue River	Tongue River	73.9	9.0	9.9	18.8	8.2**	17
Swiftcurrent Cr.	Sherburne Lk.	66.1	16.8	16.2	19.0	17.3	22
MISSOURI RIVER BASIN - WYOMING							
Shoshone River	Buffalo Bill	440.0	213.2	143.9	139.7	270.8	23
Wind River	Boysen	408.6	412.5	240.6	81.9	278.7**	6
Wind River	Pilot Butte	31.6	11.3	9.2	11.7	12.9	22
Bull Creek	Bull Lake	152.0	86.4	76.0	72.6	63.9*	19
Belle Fourche	Key Hole	190.0	11.0	12.5	19.4	11.3**	5
MISSOURI RIVER BASIN - NORTH DAKOTA							
Heart River	Heart Butte	54.8	57.6	44.0	46.8	51.8**	7
Heart River	Dickerson	4.3	4.3	3.2	3.0	3.7**	6
Missouri River	Garrison Lk.	13805.0	4692.0	602.0	524.0	- -	3
MISSOURI RIVER BASIN - SOUTH DAKOTA							
Belle Fourche	Belle Fourche	185.0	--	28.4	69.8	- -	2
Cheyenne River	Angostura	160.0	59.0	25.4	77.2	- -	2
Cheyenne River	Deerfield	15.1	10.7	8.6	10.3	- -	4
Grand River	Shadehill	84.0	80.0	134.1	128.9	134.0**	5
Missouri River	Ft. Randall	2401.6	992.1	667.1	1629.0	- -	3

* Less than 15 years in 1938-52 period. Average for 15 years nearest the base period

** Average for period of record

3/ Gross contents including 617,000 A. F. dead storage

STATUS OF RESERVOIR STORAGE
COLUMBIA RIVER IN MONTANA
January, 1958

BASIN & STREAM	RESERVOIR	USABLE CAPACITY 1000.A.F.	USABLE STORAGE - 1000 ACRE FEET				
			1958	1957	1956	1938-52 AVG.	YRS.
<u>COLUMBIA RIVER BASIN</u>							
Flint Creek	Georgetown Lk.	31.0	23.2	21.1	23.8	35.5*	17
S. Fk. Flathead	Hungry Horse	3500.0	2103.0	1983.0	3029.0	1787.0**	6
Flathead River	Flathead Lake	1791.0	1279.0	996.7	925.5	938.0	50
Flathead River 6/	Camas Res.	42.8	25.5	29.2	33.8	19.6*	17
Flathead River 7/	Mission Valley	98.6	16.3	27.9	28.6	32.4*	17

* Less than 15 years in 1938-52 period. Average for 15 years nearest the base period

** Average for period of record

6/ Camas Reservoirs are shown as a sum of (4) small reservoirs on the west side of Flathead Lake located on Dry Creek and Little Bitterroot River

7/ Mission Valley Reservoirs are shown as a sum of (8) small reservoirs located south and east of Flathead Lake. Both Camas and Mission Valley reservoirs are operated by the Indian Irrigation Service.

Federal - State - Private
COOPERATIVE SNOW SURVEYS

Furnishes the basic data
necessary for forecasting
water supply for irrigation,
domestic and municipal water
supply, hydro-electric power
generation, navigation,
mining and industry

"WATER IS THE WEST'S GREATEST RESOURCE"